TERRESTRIAL ANIMAL HEALTH STANDARDS COMMISSION REPORT

SEPTEMBER 2007

DRAFT GUIDELINES ON DOG POPULATION CONTROL

Preamble: Stray and feral dogs pose serious human health, socio-economic, political and animal welfare problems in many countries ~~of the world~~. ~~Many of these are developing countries and others fall in the least developed category.~~ Whilst acknowledging human health is a priority including the prevention of zoonotic diseases notably rabies, the OIE recognises the importance of controlling dog populations without causing unnecessary or avoidable animal suffering. Veterinary Services should play a lead role in preventing zoonotic diseases and ensuring animal welfare and should be involved in dog population control.

Guiding principles

The following guidelines are based on those laid down in Section 3.7. of the *Terrestrial Animal Health Code*. Some additional principles are relevant to these guidelines:

1. The promotion of responsible dog ownership can significantly reduce the numbers of stray dogs and the incidence of zoonotic diseases

2. Because dog ecology is linked with human activities, management of dog populations has to be accompanied by changes in human behaviour to be effective.

Article 1

Definitions

~~a)~~**Stray ~~Dog~~ dog: any** dog not under direct control or not prevented from roaming

Types of stray dog

a) free roaming owned dog not under direct control or restriction at a particular time;

b) free roaming dog with no owner;

c) feral dog: domestic dog that has reverted to the wild state and is no longer directly ~~dependant~~ dependent upon humans for successful reproduction.

~~b)~~**Owned ~~Dog~~ dog:** dog with a person that claims responsibility ~~is responsible~~ for this animal.

~~c)~~**Person:** This can include more than one individual, and could comprise family/household members or an organisation.

~~d)~~**Responsible ~~Ownership~~ ownership:** The situation whereby a person (as defined above) accepts and commits to perform various duties focused on the satisfaction of the psychological, environmental and physical needs of a dog ~~(or other pet)~~ and to the prevention of *risks* (aggression, *disease* transmission or ~~causing~~ injuries) that the ~~pet~~ dog may cause to the

community, other animals or the environment.

~~e)~~**Euthanasia:** the act of inducing death in a humane manner.

f) Competent Authority: means the *Veterinary Services*, or other Authority of a Member Country, having the **responsibility** and competence and for ensuring or supervising the implementation of animal health measures or other standards in the *Terrestrial Code*.

~~g)~~**Dog ~~P~~population ~~C~~control ~~P~~programme~~: A programme with the objective of reducing the number of stray dogs.~~** A programme with the aim of reducing a dog population to a particular level and/or maintaining it at that level and/or managing it in order to meet a predetermined objective (see Article 2).

~~h)~~**Carrying capacity:** is the upper limit of the dog population density that could be supported by the habitat based on the availability of resources (food, water, shelter)~~,~~ and human acceptance.

Article 2

Dog population control programme ~~optional~~ objectives

The objectives of a programme to control the dog population may include the following:

1. improve health and welfare of owned and stray dog population
2. reduce numbers of stray dogs
3. ~~Create~~ assist in the creation and maintenance of a rabies immune dog population
4. promote responsible ownership;
5. reduce the risk of zoonotic diseases other than rabies;
6. manage other risks to human health e.g. parasites;
7. prevent harm to the environment
8. prevent illegal trade and trafficking.

Article 3

Responsibilities and competencies

1. *Veterinary Authority* ~~Administration~~

   The *Veterinary Authority* ~~Administration~~ is responsible for the implementation of animal health legislation ~~and for controlling outbreaks of notifiable animal diseases such as foot and mouth disease and avian influenza~~. Control of endemic zoonotic diseases such as rabies and parasitic *infections* (e.g. Echinococcus spp.) would require technical advice from the *Veterinary Authority* ~~Administration~~, as animal health and some aspects of public health are within this

Authority's competence but organising and/or supervising dog control schemes is frequently the responsibility of government agencies other than the *Veterinary Authority* ~~Administration~~.

~~In many countries the Veterinary Authority Administration is in the Ministry of Agriculture.~~

2. Other government agencies

The responsibilities of other government agencies will depend on the ~~disease~~ risk being managed and the objective/nature of the dog population control measures employed.

The Ministry or other Agency responsible for Public Health would normally play a leadership role and may have legislative authority in dealing with zoonotic diseases. Control of stray dogs ~~in regards~~ with regard to other human health risks (e.g. stray dogs on roads; dog attacks within communities) may fall within the responsibility of the Public Health Agency but is more likely to be the responsibility of police or other agencies for public safety/security operating at the State/Provincial or municipal level.

Environment Protection Agencies (normally within a National or State/Provincial Ministry for the Environment) may take responsibility for ~~the~~ controlling problems associated with stray dogs when they present a hazard to the environment (e.g. control of feral dogs in national parks; prevention of dog attacks on wildlife or transmission of *diseases* to wildlife) or where a lack of environmental controls is giving rise to stray dog populations that threaten human health or access to amenities. For example, Environmental Protection agencies may regulate and enforce measures to prevent dogs (and other wild animals) from accessing waste or human sewage.

3. Private sector veterinarians

The private sector veterinarian is responsible for providing advice to pet owners consulting the veterinarian for advice or treatment of a dog. The private sector veterinarian can play an important role in *disease* surveillance ~~as~~ because he/she might be the first to see a dog suffering from a *notifiable disease* such as rabies. It is necessary that the private sector veterinarian follow the procedure established by the *Veterinary Authority* for responding to and reporting a suspected rabies case or a dog that is suffering from any other *notifiable disease*. Private sector veterinarians also play an important role (often in liaison with the police) in dealing with cases of neglect that can lead to problems with stray and mismanaged dogs.

The private veterinarian has competence and will normally be involved in pet dog health programmes and population control measures, including health testing and vaccination, kennelling during the absence of the owner, sterilisation and euthanasia. Two-way communication between the private sector veterinarian and *Veterinary Authority*, often via the medium of a veterinary professional organisation, is very important and the *Veterinary Authority* is responsible to set up appropriate mechanisms for this action.

4. Non Governmental Organisations (NGOs)

NGOs are potentially important partners of the *Veterinary Services* in contributing to public awareness and understanding and helping to obtain resources to contribute in a practical way to the design and successful implementation of dog control programmes. NGOs can supply

local knowledge on dog populations and features of ownership, as well as expertise in handling and kennelling dogs and the implementation of large scale vaccination and sterilisation programmes. NGOs can also contribute, together with veterinarians and the authorities in educating the public in responsible dog ownership. NGOs can help to obtain funding for control programmes, particularly in countries where governments may depend on support from NGOs for programs carried out to assist poor communities.

5. Local Government Authorities

Local Government Authorities are responsible for many services and programmes that relate to health, safety and public good within their jurisdiction. In many countries the legislative framework gives authority to local government agencies in regard to aspects of public health, environmental health/hygiene and inspection/compliance activities.

In many countries local government agencies are responsible for the control of stray dogs (e.g. dog catching and shelters) and the alleviation of the problems stray dogs cause. This would normally be done with advice from a higher level (national or state/provincial) authority with specialised expertise in regard to public health and animal health. Collaboration with the private sector veterinarians (e.g. in programs to sterilise and vaccinate stray dogs) is a common feature of dog control programs. Regardless of the legislative basis, it is essential to have the co-operation of local government authorities in the control of stray dogs.

6. Dog owners

When a person takes on the ownership of dog there should be an immediate acceptance of responsibility for that dog, and for any offspring it may produce, for the duration of its life or until a subsequent owner is found. The owner must ensure the dog is protected, as far as possible, from infectious *diseases* (e.g. through vaccination and parasite control) and from unwanted reproduction (e.g. through surgical sterilisation). Owners should ensure that the dog's ownership is clearly identified (preferably with permanent identification such as a tattoo or microchip) and, where required by legislation, registered on a centralised database. All reasonable steps should be taken to ensure that the dog does not roam out of control in a manner that would pose a problem to the community and/or the environment.

Article 4

Considerations in planning a dog population control programme ~~measures~~

In the development of a dog population control programme it is recommended that the authorities establish an advisory group, which should include ~~appropriate~~ veterinarians, experts in dog ecology, dog ownership and zoonotic diseases, and representatives of relevant~~and~~ stakeholders (local authorities, human health services/authorities, environmental control services/authorities and the public). The main purpose of this advisory group would be to analyse the problem, identify the causes and propose the most effective approaches to use in the short and long term.

Important considerations are as follows:

1. Identifying the sources of stray dogs

   a) Owned animals that roam freely

   b) Animals that have been abandoned by their owner, including animals resulting from:

      i) uncontrolled breeding of owned dogs;

      ii) unowned dogs that reproduce successfully.

2. Estimating the existing number, distribution and ecology~~(To be completed)~~

Practical tools that are available include ~~Using available practical tools such as~~ registers of dogs, population estimates, surveys of dogs, owners, dog shelters and associated veterinarians etc. The important factors relevant to the dog carrying capacity of the environment include food, shelter, water and human behaviour.

A methodology, including generalised dog identification and centralised registration, ~~must~~ should be established ~~in order~~ to make an estimate of the total dog population.

An overview of appropriate methodologies may be found in Annex I.

The same methodology ~~must~~ should be used at appropriate intervals to assess population trends. ~~Find references if possible.~~

- ~~The~~ Identify the important factors relevant to the dog carrying capacity of the ~~environment. These generally include food, shelter, water, and human behaviour~~.
- ~~Add examples of good methodology if possible~~

3. Legislation

Legislation that would help authorities establish ~~to establishing~~ successful dog control programmes should include the following key elements:

a) registration and identification of dogs and licensing of dog breeders ~~owners;~~

b) rabies vaccination;

c) veterinary procedures (e.g. surgical procedures);

d) control of dog movement (restrictions within the country);

e) control of dog movement (international movement);

f) control of dangerous dogs;

g) regulations on the breeding and sale of dogs ~~Commercial dog production;~~

h) environmental controls (e.g. *abattoirs*, rubbish dumps, dead stock facilities);

i) dog shelters;

j) animal welfare, including humane capture and killing methods.

4. Resources available to authorities

a) Human resources

b) Financial resources

c) Technical tools

d) Infrastructure

e) Cooperative activities

f) Public-private-NGO partnerships

g) Central-state or province-local partnerships.

Article 5

Control measures

The following control measures should be implemented according to the ~~situation in~~ national context and local circumstances ~~of Member Countries~~. ~~They can~~ Measures may be used in combination. ~~or singly~~. Killing of dogs, used alone, is not an effective control measure. If used, it should be combined with other measures to achieve effective long term control. It is also important that authorities gain an understanding of people's attitudes towards dog ownership so that they can develop a cooperative approach to the control of dog populations.

1. Education and ~~promotion~~ legislation ~~of~~ for responsible ownership ~~**(To be completed)**~~

~~The health and welfare of domestic dogs may be improved through the promotion of responsible human ownership. Minimizing stray dogs population, in combination with educating humans, particularly children about specific behaviours, can reduce dog bite injury and prevent some major zoonotic diseases.~~

~~Responsible dog ownership includes the control of reproduction of dogs under direct human supervision such that offspring of owned dogs are not abandoned.~~

The owned dog population is a primary source of stray dogs, through the abandonment of unwanted dogs and their offspring, and through allowing owned dogs to roam unrestricted, contributing to the stray population. Encouraging dog owners to be more responsible will reduce the number of dogs allowed to roam, improve the health and welfare of dogs, and minimise the risk that dogs pose to the community. The promotion of responsible dog ownership though legislation and education is a necessary part of a dog population management programme. Collaboration with responsible animal welfare NGOs and private veterinarians will assist Veterinary Authorities in establishing and maintaining programmes.

Education on responsible dog ownership (for the currently owned dog and any offspring it produces) should address the following elements:

a) the importance of proper care to ensure the welfare of the dog and any offspring; this may include preparing the dog to cope with its environment through attention to socialisation and training;

b) registration and identification of dogs (see Article 5. 2.);

c) prevention of zoonotic diseases, eg through regular vaccination in rabies endemic areas;

d preventing negative impacts of dogs on the community, via pollution (eg faeces and noise), risks to human health through biting or traffic accidents and risks to wildlife, livestock and other companion animal species.

e control of dog reproduction

In order to achieve a shift towards responsible ownership, a combination of legislation, public awareness, education, and promotion of these elements will be required. It may also be necessary to improve access to resources supporting responsible ownership, such as veterinary care, identification and registration services and measures for control of zoonotic diseases.

2. Registration and identification of dogs (licensing)

A core component of dog population management by the Competent Authorities is the registration and identification of owned dogs. This ~~and~~ may include granting licences to owners. Registration and identification may be emphasized as part of responsible dog ownership and are often linked to animal health programs, for example, mandatory rabies vaccination.

Registration ~~and identification~~ of animals in a centralised database can be used to support the enforcement of legislation, the reuniting of lost animals with owners and ~~may be used as a tool to encourage~~ control of dog reproduction ~~control of owned dogs~~ through financial incentives ~~reduced fee schedule~~ to ~~register neutered~~ sterilise dogs.

3. Reproductive control

Controlling reproduction in dogs prevents the birth of unwanted ~~litters of~~ puppies and can help address the balance between demand for dogs and the size of the population. It is advisable to focus efforts to control reproduction on those individuals or groups in the

dog population identified as the most productive and the most likely to be the sources of unwanted and stray dogs, ~~as this will~~ to ensure best use of resources. Methods of controlling reproduction will require direct veterinary input to individual animals, involvement of both private and public veterinary sectors may be required to meet demand. The control of reproduction is essentially the responsibility of owners and can be incorporated into education on responsible ownership (section 5 a.). Methods for controlling reproduction in dogs include:

a) surgical sterilisation;

b) chemical sterilisation;

c) chemical contraception;

d) separation of female dogs during oestrus from ~~entire~~ unsterilised males.

Surgical sterilisation should be carried out in a humane manner and include appropriate use of pain relief.

Any chemicals or drugs used in controlling reproduction should be shown to have appropriate safety, quality and efficacy for the function required and used according to the ~~manufacturers~~ manufacturer's and Competent ~~Authorities~~ Authority's regulations. In the case of chemical ~~steriliants~~ sterilants and contraceptives, ~~this may require~~ ~~further~~ research and field trials may need to be completed before use.

4. Removal and handling

The *Competent Authority* should collect dogs that are not under direct supervision and verify their ownership. Capture, transport, and holding of the animals should be done humanely. The *Competent Authority* should develop and implement appropriate legislation and training to regulate these activities. Capture should be achieved with the minimum force required and equipment should be used that supports humane handling. Snares and uncovered wire loops should not be used for capture.

5. Management of dogs removed from communities

Competent authorities have the responsibility to develop minimum standards for the housing (physical facilities) and care of these dogs. There should be ~~a~~ provision for holding the dogs for a reasonable period of time to allow for reunion with the owner and, as appropriate, for rabies observation. ~~A period of 7–10 days is often used for this purpose~~.

a) Minimum standards for housing should include the following provisions:

   i) site selection: Access to drainage, water and electricity are essential and environmental factors such as noise and pollution should be taken into account;

   ii) kennel size, design and occupancy taking exercise into account;

   iii) *disease* control measures including isolation facilities.

b) Management should address:

i) adequate fresh water and nutritious food;

ii) regular hygiene and cleaning;

iii) routine inspection of the dogs;

iv) monitoring of health and provision of required veterinary treatments;

v) policies and procedures for rehoming, sterilisation and euthanasia;

vi record keeping and reporting to authorities.

Dogs that are removed from a community may be reunited with the owner or offered to new owners for adoption (rehoming). This provides an opportunity to promote responsible ownership and good animal health care (including rabies vaccination). ~~including animal health care through vaccination against common diseases of dogs, control of ecto- and endo-parasites, and vaccination against major zoonotic diseases such as rabies. Incentives for dog reproduction control may be provided through the provision of neutering services at a reduced rate or the release for adoption of only neutered animals~~ Sterilisation of dogs prior to adoption should be considered. The suitability of new owners to adopt dogs should be assessed and owners matched with available animals. The effectiveness of ~~this strategy i.e. offering dogs to new owners~~ rehoming may be limited due to the suitability and number of dogs.

Dogs that are removed from a community may in some cases be provided health care (including rabies vaccination), sterilised, and released to their local community at or near the place of capture. ~~, who agree to take responsibility for the health, welfare and management of the animal. The beneficial effect of this practice for dog welfare and population management is unknown. With regard to disease control, such as for rabies and possibly others, some beneficial effect may be realized. This may be short or long time.~~ This method is more likely to be accepted in the situation where the presence of stray dogs is considered to be inevitable and is well tolerated by the local community.

This method is not applicable in all situations and may be illegal in countries where legislation prohibits the abandonment of dogs. Problems caused by dogs, such as noise, faecal pollution and traffic accidents, would not be alleviated as dogs are returned to the local community and their movements are not restricted. If the local community has owned dogs, consideration should be given to the potential encouragement of abandonment of unwanted. In the situation where many dogs are owned, a population control programme that focuses on neutering and responsible ownership may be more appropriate.

It is recommended that before adopting this approach, a cost-benefit analysis is conducted. Factors such as the monetary costs, impact on culture of ownership and public safety should be assessed as well as the benefits for *disease* control and animal welfare as well as any societal benefits.

c) If this method is adopted, the following factors should be addressed:

i) Raising awareness of the programme within the local community to ensure understanding and support

ii) Use of humane methods for catching, transporting and holding dogs

iii) Correct surgical technique, anaesthesia and analgesia, followed by post-operative care

iv) *Disease* control may include blanket vaccination (e.g. rabies) and treatments and testing for *diseases* (e.g. leishmaniasis) followed, as appropriate by treatment or euthanasia of the dog.

v) Behavioural observation may be used to assess if dogs are suitable for release. If not suitable for release or re-homing euthanasia should be considered.

vi) Permanent marking (e.g. tattoo) to indicate that the animal has been sterilised. Individual identification allows for tracking of vaccination status and treatment history. A visible identification (e.g. collar) may also be used to prevent unnecessary recapture. Identification can also be taken to indicate a level of 'ownership' by the organisation/authority responsible for carrying out this intervention.

vii) The dog should be returned to a place that is as near as possible to the place of capture.

viii) The welfare of dogs after release should be monitored and action taken if required.

Dogs that are removed from a community may~~, in some cases~~, be too numerous or may be unsuitable ~~to place~~ responsible ~~ownership. If elimination of the excess animals is the only option, killing should be under regulation by a~~ for any rehoming scheme. If euthanasia of these unwanted animals is the only option, the procedure should be conducted in accordance with the regulations of the Competent Authority ~~and conducted humanely~~(see Article 4 k).

~~A number of selected animals, could be released if "*environmentally compatible*", meaning that, once again, the feasibility of this strategy is very much related to the local people attitude/resources availability:~~

- ~~Risk-benefit evaluation of Catch Neuter Release & Monitoring (CNR&M) in terms of public safety and AW.~~
- ~~Proper behavioural evaluation of dogs when removed for problems related to public nuisance~~
- ~~Monitoring needed to evaluate individual health and welfare~~
- ~~Sufficient level of public tolerance, food and assistance provided by responsible people/community~~
- ~~Permanent identification (i.e. surgical sterilization, rabies vaccination, echinococcosis treatment, Leishmaniasis negative test). These actions clearly recon duct the animal to an "owner", both intended as public (local municipality, regional government) or private~~
- ~~Possibly clearly visible at distance (i.e. painted collars)~~

~~**Advantages**: Possible strategy in an early stage, when scarce resources are in place, if adopted in very specific situation it may also promote the societal value of animals and the benefits of a positive human-animal relationship (Rome's cat colony, "community" dogs)~~

~~**Disadvantages:** Ineffective over a long term since not promoting responsible ownership concept, possible AW concerns due to persistent intolerance by the community, possible risk to human safety and damage of the private property due to improper selection of animals.~~

~~Preferably to be used as a "spot" solution in specific situations and only in addition to other measures (humane education, door to door reuniting programs, adoption programs), possibly not to be used as the sole method of stray dog population control as a long term strategy.~~

6. Environmental controls

Steps should be taken to reduce the carrying capacity, such as excluding dogs from sources of food (e.g. rubbish dumps and *abattoirs*, and installing animal-proof rubbish containers).

This should be linked to a reduction in the animal population by other methods, to avoid animal welfare problems.

7. Control of dog movement – international (export/import)

Chapter 2.2.5 of the Terrestrial Animal Health Code provides recommendations on the international movement of dogs between rabies free countries and countries considered to be infected with rabies.

8. Control of dog movements – within country (e.g. leash laws, roaming restrictions)

Measures for the control of dog movement in a country are generally invoked for ~~two~~ the following reasons:

a) for rabies control when the *disease* is present in a country

b) for public safety reasons

c) for the safety of "owned dogs" in an area or locality when a stray dog control programme is in place

d) to protect wildlife and livestock.

~~In both cases i~~ It is essential that dogs are registered and permanently identified to control or confine these dogs, reunite them if collected and to keep the relevant sanitary information recorded.

It is necessary to have empowering legislation ~~to give the necessary power is necessary~~ and a national or local infrastructure comprising ~~of~~ organization, administration, staff and resources ~~is essential~~ to encourage the finders of a stray dog to report to the *Competent Authority*.

~~The following 3 grades of movement control can be applied:~~

- ~~Absolute control (confinement, leash end muzzle), feasible during a limited periods~~ such ~~as~~ for ~~an~~ emergency
- ~~Partial control (obedience if not on leash during daylight, confinement between the relevant information~~ times of ~~5pm and 8 am)~~
- ~~Control during specific times (rabies vaccination campaign, stray dog roundup)~~

9. Regulation of commercial ~~Animal~~ dog dealers

~~While the majority of animal breeders and dealers are committed to raising and selling physically and psychologically healthy pets, regulation is necessary to ensure that all of these operations provide adequate care.~~

~~The law should require the humane care and treatment of certain animals sold as pets in retail stores as well at the wholesale level, transported in commerce, and used in research or exhibits.~~

~~Individuals using or working with such animals should be licensed and they must comply with regulations and standards.~~

- ~~Standards of Care and Recordkeeping~~

  ~~Businesses in the commercial pet trade must maintain minimum standards for veterinary~~

~~care and animal management. The requirements should cover housing, handling, sanitation, food, water, and protection against extremes of weather and temperature.~~

~~To prevent lost or stolen animals from entering trade channels, breeders and dealers are required to keep records that identify the source and disposition of all regulated animals that come into their possession.~~

- Shipping ~~and~~ Handling

~~Specific regulations and standards are needed to regulate the transport of animals by commercial carriers. These rules help ensure that licensed dealers, contract carriers, and intermediate handlers treat regulated animals humanely. Transported animals must meet established minimum age and health certification requirements.~~

Regulation is needed to ensure that dog breeders and dealers are identified by the C*ompetent Authority* and are committed to raising and selling physically and psychologically healthy animals, as unhealthy animals may be more likely to be abandoned to become part of the stray population. Regulations should include specific requirements for accommodation, provision of suitable food, drink and bedding, adequate exercise, veterinary care and *disease* control. Breeders and dealers establishments should be inspected at regular intervals, including veterinary inspections. Advice on proper animal care should be given to all new owners of dogs.

10. Reduction in dog bite incidence

~~Propensity to bite is influenced by heredity, early experience, socialisation & training, health and human behaviour towards the dog. Breed or type specific bans are difficult and costly to enforce, provide a false sense of security to the community and, where enacted, no data currently supports them as effective in reducing incidence of dog bites; therefore, they are not recommended. Specific behaviours or incidences can be used as criteria to facilitate identification of a dog as 'dangerous' and appropriate measures taken to control the animal by the competent authority. For example, a dog that has been reported to have bitten someone or something (livestock or pets) may be required by law to be to be confined on the owner's property and kept on a lead (and if necessary muzzled) when in public. Note that confinement by tethering should be avoided as this can increase the likelihood of aggressive behaviour.~~

The most effective means of reducing prevalence of dog bites are education and placing responsibility on the owner~~, not the animal~~. Dog owners should be educated ~~trained~~ in principles of responsible pet ownership as described in Article 5.a. Legal mechanisms that enable the competent authorities to impose penalties or otherwise deal with irresponsible owners are necessary. Mandatory registration and identification schemes will facilitate the effective application of such mechanisms. Young children are the group at highest ~~most at~~ risk ~~group~~ for dog bites. Education programmes focussed on appropriate dog-directed behaviour have been demonstrated to be effective in reducing dog bite prevalence and these programmes should be encouraged.

11. Euthanasia

When euthanasia is practised, the ~~procedures used should comply with~~ general principles ~~the presented~~ laid down in the Terrestrial Animal Health Code ~~2006 (Article 3.7.6.1)~~ should be followed, with the emphasis on using the most practical, rapid and humane methods and ensuring operator safety.

For practical reasons, different procedures may be used in rural and urban areas.

~~For reasons of convenience, different procedures could be used in rural and in urban areas. Dogs should only be euthanized after holding for a period of time to allows for the owner to locate his/her dog.~~

Table 1 shows a list of methods for the euthanasia of dogs.

~~They fall into two major categories based on wether it is necessary to handle or restrain the~~

~~dog or not in order to euthanize it.~~

~~Where capture or restraint procedures give rise to a risk or potential risk of human exposure to rabies, procedures that do not require restraint of dogs are preferanble.~~

~~The methods are not described in any particular order.~~

	Procedure	Capture	Restraint = Handling	Advantages/Disadvantages
Urban area	Electrocution	Yes	No	Affordable equipment: 220 V mains current; gloves + boots. Instant death.
	Carbon monoxide (CO)	Yes	No	Needs appropriate premises; puts personnel at risk. Slow death.
	CO_2	Yes	No	As CO_2 is heavier than air, the dogs can lift their heads over the CO_2 layer and death is slow.
	Barbiturates			Requires an appropriate dose and pre-anaesthetic. Administered under veterinary supervision and requires trained personnel. Slow death.
	Intravenous	Yes	Yes	
	Intracardial	Yes	Yes	
	Intraperitoneal	Yes	Yes	
	T 61 = Tanax			Dangerous for personnel in the event of accidental injection. Slow death.
	Intravenous	Yes	Yes	
	Intracardial	Yes	Yes	
	Intrapulmonary	Yes	Yes	
Rural area	Free bullet used from long range	No	No	Fast death. Risk of accident (same as for hunting)

Table 1: List of methods for the euthanasia of dogs

Euthanasia method	Specific method	Animal welfare concerns/ implications	Key animal welfare requirements	Considerations relating to operator security	Advantages	Disadvantages
Chemical -via injection	Barbiturates	Correct restraint is needed. IP is slow and may be irritant. IC injection is a painful procedure.	Recommend to use IV injection. When using IP injection, the solution may be diluted or local anaesthetic agent used in conjunction. IC should only be performed on unconscious animal and by skilled operator.	Correct restraint is needed. Administered under veterinary supervision and requires trained personnel.	Speed of action generally depends on the dose, concentration, route and rate of injection. Barbiturates induce euthanasia smoothly, with minimal discomfort to the animal. Barbiturates are less expensive than many other euthanasia agents.	Mild aesthetic objection as terminal gasps may occur in unconscious animals. These drugs persist in the carcass and may cause sedation or death in animals that consume the cadaver.
	Embutramide + Mebezonium + Tetracaine	Muscle paralysis may occur before lost of consciousness if injection given rapidly	Use slow IV injection with sedation to permit slow rate of injection.	Correct restraint is needed. To be administered under veterinary supervision and by trained personnel.	Quite low cost.	Unavailable/unlicensed in some countries
	Anaesthetic agent overdose (thiopentone or propofenol)	Underdosing may lead to recovery	IV injection of a sufficient dose	Correct restraint is needed. To be administered under veterinary supervision and by trained personnel.	Generally quick action and minimal discomfort to animal.	Large volume required (cost implications)
	Potassium chloride (KCl)	K^+ is cardiotoxic and very painful if used without anaesthetic agent.	Only use on anaesthetised animals, IV injection	Requires trained personnel.	Readily available without veterinary control.	Prior need for anaesthetic (cost and availability implications)

Table 1: List of methods for the euthanasia of dogs

Euthanasia method	Specific method	Animal welfare concerns/ implications	Key animal welfare requirements	Considerations relating to operator security	Advantages	Disadvantages
	Free bullet	Can be inhumane if shot is inaccurate and dog is only wounded; dog may also escape.	Skilled operator essential.	Risk of injury of operator.	Not necessary to handle or capture dog.	Brain tissue may be unavailable for rabies diagnosis. Risk of injury to bystanders. Legal constraints on use of firearms..
Mechanical	Penetrating captive bolt	Can be inhumane if shot is inaccurate and dog is only wounded.	Skilled operator essential.	Animal must be restrained. Skilled operator essential.	No risk to operator (cf free bullet)	Brain tissue may be unavailable for rabies diagnosis. Legal constraints on use of firearms. May raise aesthetic objections.
	Exsanguination	Onset of hypovolaemia may cause dog to become anxious.	Only use on unconscious animal	Danger to operator through use of sharp instrument.	Material requirements minimal.	Must be done on unconscious animal. Aesthetically objectionable

Table 1: List of methods for the euthanasia of dogs (cont)

Euthanasia method	Specific method	Animal welfare concerns/ implications	Key animal welfare requirements	Considerations relating to operator security	Advantages	Disadvantages
Gaseous	Carbon monoxide (CO)	Gas is aversive. Inadequate concentration of CO is not lethal and can cause suffering. Signs of distress (convulsions, vocalization and agitation) may occur.	Compressed CO in cylinders must be used to achieve and maintain adequate concentration, which must be monitored. Note: fumes from gasoline engines are irritant and this source of CO is not recommended.	Very hazardous for operator - gas is odourless and causes both high and chronic toxicity.	Dog dies quite rapidly if concentration of 4 to 6% used. No odour (therefore no aversive effect). Gas is not flammable or explosive except at concentration greater than 10%.	
	Carbon dioxide (CO_2)	Gas is highly aversive. Inadequate concentration of CO_2 is not lethal and can cause suffering. CO_2 is heavier than air, so when incomplete filling of the chamber occurs, dogs may raise their head and avoid exposure. Few studies on adequate concentration and animal welfare.	Compressed CO_2 gas chamber is the only recommended method because the concentration can be monitored and regulated.	Minimal hazard to operator when properly designed equipment used.	Gas is not flammable or explosive and causes quite rapid anaesthesia when correct concentrations used. Low cost. Readily available as compressed gas	Anaesthesia can be quite rapid but death may take some time.
	Inert gas (nitrogen, N_2 argon, Ar)	Loss of consciousness is preceded by hypoxemia and ventilatory stimulation, which may be distressing to the dog. Re-establishing a low concentration of O_2 (ie greater than or equal to 6%) in the chamber	Concentration above 98% must be achieved rapidly and maintained. Properly designed equipment must be used	Minimal hazard to operator when properly designed equipment used.	Gas is not flammable or explosive and is odourless. Readily available as compressed gas.	High cost. Little data on animal welfare implications in dogs.

		before death will allow immediate recovery.				

Table 1: List of methods for the euthanasia of dogs (cont)

Euthanasia method	Specific method	Animal welfare concerns/ implications	Key animal welfare requirements	Considerations relating to operator security	Advantages	Disadvantages
Gaseous	Anaesthetic gas overdose (halothane or enflurane)	Animal may struggle and become anxious during induction. Vapours may be irritating and can induce excitement.	Supplementation with air or O_2 required to avoid hypoxemia during induction phase.	Some gases may be hazardous, especially for pregnant women. General recommendation: Avoid human exposure to greater than or equal to 2ppm to avoid narcosis.	Gas is not flammable or explosive. Valuable for use with small animals.	High cost. Anaesthetic and euthanasia properties of the gas used must be known. Isoflurane has a pungent odour. Methoxyflurane's action is slow and dog may become agitated.
Electrical	Electrocution	Cardiac fibrillation occurs before onset of unconsciousness, causing severe pain if dog is conscious. Pain can also be caused by violent extension of the limbs, head and neck. Method may not be effective if insufficient current applied.	Dogs must be unconscious before being electrocuted. This can be accomplished by electrical stunning (current through the brain to produce an instantaneous stun) or anaesthesia. Electrodes should span the brain in order that the current passed through the brain Proper equipment and trained operator is essential.	May be hazardous for operator, who should use protective equipment (boots and gloves).	Low cost.	Inhumane if performed on conscious dog. May raise aesthetic objections.

KEY to abbreviations used in Table 1:
IV: intravenous
IP: Intraperioneal
IC: Intracardiac

~~**To be developed for each method**~~

~~1. Introduction~~

~~2. Requirements for effective use~~

~~3. Advantages~~

~~4. Disadvantages~~

~~5. Conclusions~~

a) ~~Summary assessment of~~ Comments on methods for the euthanasia of dogs:

i) Restraint

When a dog needs to be restrained for any procedure, including euthanasia, ~~procedure,~~ this should always be done with full regard for operator security and animal welfare. ~~In order to use~~ Some euthanasia methods must be used in association with sedation or anaesthesia in order to be considered humane ~~way, may be required~~.

ii) Special equipment

When special equipment is needed to perform euthanasia (eg. gas chamber) the system should be ~~properly~~ designed for the purpose and regularly maintained in order to achieve operator security and animal welfare.

iii) The following methods, procedures and practices are unacceptable on animal welfare grounds:

- Chemical methods:
  - Embutramide +Mebezonium +Tetracaine without sedation or by other than IV injection
  - Chloral hydrate
  - Nitrous oxide : may be used with other inhalants to speed the onset of anaesthesia, but alone it does not induce anaesthesia in dogs
  - Ether
  - Chloroform
  - Cyanide
  - Strychnine
  - Neuromuscular blocking agents (nicotine, magnesium sulphate, potassium chloride, all curariform agents) : when used alone, respiratory arrest occurs before lost of consciousness, so the dog may perceive pain.

- Formalin
- Household products and solvents

- Mechanical methods:
  - Air embolism on conscious animal
  - Burning
  - Exsanguination of conscious animal
  - Decompression: expansion of gas trapped in body cavities may be very painful
  - Drowning
  - Hypothermia, rapid freezing
  - Stunning: stunning is not a euthanasia method, it should always be followed by a method which ensures death.
  - Kill-trapping
  - Electrocution of conscious animal.

Because neonatal animals are resistant to hypoxia, methods that depend upon achieving a hypoxic state (eg CO_2, CO, N_2, Ar) should not be used. These methods should not be used in animals aged less than 4 months, except to produce loss of consciousness and should be followed by another method to cause death. Cervical dislocation and concussion may be used in neonatal dogs. Operators must be well trained in the use of physical techniques to ensure that they are correctly and humanely carried out. The dog must be exsanguinated immediately after concussion or cervical dislocation.

iv) Confirmation of death

For all methods of euthanasia used, death must be confirmed before animals are disposed of or left unattended. If an animal is not dead, another method of euthanasia must be performed.

v) Carcass disposal

Carcasses should be disposed of in a manner that complies with legislation. Attention must be paid to the risk of residues occurring in the carcase. Incineration is generally the safest way of carcase disposal.

Article 6

Monitoring and evaluation of dog population control programmes

Monitoring and evaluation allows for comparison of important indicators against the baselines measured during initial assessment (Article 4). The three main reasons for carrying out monitoring and evaluation are:

1. To help improve performance, by highlighting both problems and successful elements of interventions.

2. For accountability, to demonstrate that the programme is achieving its aims.

3. Assuming methods are standardised, to compare the success of strategies used in different locations and situations.

Monitoring is a continuous process that aims to check the programme progress against targets and allows for regular adjustments. Evaluation is a periodic assessment, usually carried out at particular milestones to check the programme is having the desired and stated impact. These procedures involve the measurement of 'indicators' that are chosen because they reflect important components of the programme at different stages. Selection of suitable indicators requires clear planning of what the programme is aiming to achieve, the best selection of indicators will be one that reflects the interest of all relevant stakeholders. Standardised methodology will facilitate comparison of data from subsequent evaluations and performance between different projects. Indicators can be direct measurements of an area targeted to change (e.g. population of free roaming dogs on public property) or indirect measures that reflect change in a targeted area (e.g. number of reported dog bites as a reflection of rabies prevalence).

4. Elements that should generally be monitored and evaluated ~~most programmes will need to monitor and evaluate~~ include:

   a) Dog population size, separated by into sub-populations according to ownership and restriction of movement (i.e. roaming unrestricted or restricted by an owner);

   b) Dog welfare, in the target population (e.g. body condition score, skin conditions and injuries or lameness) and as a result of the programme (if interventions involve direct handling of dogs, the welfare of the dogs as result of this handling should be monitored);

   c) Prevalence of zoonotic diseases, such as rabies, ~~prevalence~~ in both the animal and human population ~~can be measured;~~

   d) Responsible animal ownership, including measures of attitudes and understanding of responsible ownership and evidence that this is translating into ~~actual~~ responsible behaviour.

5. There are many sources of information for measuring indicators ~~can be widespread~~, including:

   a) Feedback from the local community (e.g. through the use of structured questionnaires or 'open format' consultation processes)

   b) Records and opinions obtained from relevant professionals (e.g. veterinarians, medical doctors, law enforcement agencies, educators)

c) Animal based measurements (e.g. direct observation surveys of population size and welfare status)

The output of activities against budget should be carefully recorded in order to evaluate ~~balance~~ the effort (or cost) against the outcomes and impact (or benefit) that are reflected in the results of monitoring and evaluation ~~results~~.

~~**Article 7**~~

~~**Research needs**~~

~~**To be completed**~~

~~**Article 8**~~

~~**International cooperation**~~

~~**To be completed**~~

Annex I:

An overview of appropriate methodologies for estimating the size of dog populations.

Population estimates are necessary for making realistic plans for dog population management and zoonosis control, and for monitoring the success of such interventions. However, for designing effective management plans, data on population sizes alone are insufficient. Additional information is required, such as degrees of supervision of owned dogs, the origin of ownerless dogs, accessibility, etc.

The term "owned" may be restricted to a dog that is registered with licensing authorities, or it may be expanded to unregistered animals that are somewhat supervised and receive shelter and some form of care in individual households. Owned dogs may be well supervised and restrained at all times, or they may be left without control for various time periods and activities. Dogs without owners that claim responsibility may still be accepted or tolerated in the neighbourhood, and individuals may provide food and protection. Such animals are sometimes called "community owned dogs" or "neighbourhood dogs". For an observer it is frequently impossible to decide if a free roaming dog belongs to someone or not.

The choice of methods for assessing the size of a dog population depends on the ratio of owned versus ownerless dogs, which may not always easy to judge. For populations with a large proportion of owned dogs it may be sufficient to consult dog registration records or to conduct household surveys. These surveys should establish the number of owned dogs and the dog to human ratio in the area. In addition, questions on dog reproduction and demographics, care provided, zoonosis prevention, dog bite incidence, etc. may be asked. Sample questionnaires can be found in the "Guidelines for Dog Population Management" (WHO/WSPA 1990). Standard polling principles must be applied.

If the proportion of ownerless dogs is high or difficult to asses, then one must resort to more experimental approaches. Methods borrowed from wildlife biology can be applied. These methods are described WHO/WSPA's "Guidelines for Dog Population Management" (1990), and in more detail in numerous professional publications and handbooks, such as Bookhout (1994) and Sutherland (2006). Being generally diurnal and tolerant to human proximity, dogs lend themselves to direct observation and the application of mark-recapture techniques. Nevertheless, a number of caveats and limitations have to be taken into account. The methods are relatively labour intensive, they require some understanding of statistics and population biology, and most importantly, they are difficult to apply to very large areas. One must take into account that dog distribution is non-random, that their populations are not static, and that individual dogs are fairly mobile.

Counting of dogs visible in a defined area is the simplest approach to getting information on population size. One has to take into account that the visibility of dogs depends on the

physical environment, but also on dog and human activity patterns. The visibility of animals changes with the time of the day and with seasons as a function of food availability, shelter (shade), disturbance, etc. Repeated standardized counting of dogs visible within defined geographical localities (e.g. wards) and specific times will provide indications of population trends. Direct counting is most reliable if it is applied to small and relatively confined dog populations, e.g. in villages, where it might be possible to recognize individual dogs based on their physical appearance.

Methods using mark-recapture procedures are often considered more reliable. However, they also produce trustworthy results only when a number of preconditions are met. Mortality, emigration and recruitment into the population must be minimal during the census period. One may be able to incorporate corrective factors into the calculations.

It is therefore important that the recommended census procedures are applied at times of low dispersal and that one selects study plots of shape and size that minimize the effect of dog movements in and out of the observation area. Census surveys should be completed within a few days to a maximum of two weeks in order to reduce demographic changes. In addition, all individuals in the population must have an equal chance of being counted. This is a highly improbable condition for dogs, whose visibility depends on ownership status and degrees of supervision. It is therefore recommended that the investigator determines what fraction of the total population he/she might cover with an observational method and how much this part overlaps with the owned dog segment that he/she assesses with household surveys.

There are essentially two ways to obtain a population estimate if it is possible, in a defined area and within a few days, to tag a large number of dogs with a visible mark, e.g. a distinctive collar or a paint smudge. The first method requires that the capture (marking) effort remains reasonably constant for the whole length of the study. By plotting the daily number of dogs marked against the accumulated total of marked dogs for each day one can extrapolate the value representing the total number of dogs in the area. More commonly used in wildlife studies are mark recapture methods (Peterson-Jackson, Lincoln indices). Dogs are marked (tagged) and released back into the population. The population is subsequently sampled by direct observation. The number of marked and unmarked dogs is recorded. One multiplies the number of dogs that were initially marked and released by the number of subsequently observed dogs divided by the number of dogs seen as marked during the re-observation to obtain a total population estimate. Examples for the two methods are given in WHO/WSPA's "Guidelines for Dog Population Management" (1990).

Since the dog populations of entire countries, states, provinces or even cities are much too large for complete assessment, it is necessary to apply the methods summarized above to sample areas. These should be selected (using common sense) so that results can be extrapolated to larger areas.

Bookhout TA (ed), 1994: *Research and Management Techniques for Wildlife and Habitats*, 5th ed. The Wildlife Society, Bethesda, Maryland, 740p.

Sutherland WJ (ed), 2006: *Ecological Census Techniques* - A Handbook, 2nd ed. Cambridge

University Press, Cambridge, 448 p.

WHO/WSPA, 1990: *Guidelines for Dog Population Management*. WHO/ZOON/90.165. WHO, Geneva, 116 p.